Pest and Vector Surveillance

The Purpose of Surveillance

- To determine the types and numbers of vectors and medical pests present.
- To more effectively plan, time, and target vector and pest management efforts.
- To determine the effectiveness of control measures.

Types of surveillance programs

- Baseline -- conducted to determine the types of vectors and pests, their breeding sites, and seasonal densities.
- Operational -- help pest management personnel decide when to start/stop control measures
- Specific -- specific vector and/or pest species is targeted for surveillance.

Types of Surveillance Methods and Equipment

- Mosquito surveillance
  - Egg
  - Larvae
  - Adult

Egg surveillance

- Egg surveillance -- to locate breeding sites or presence of *Aedes aegypti, Aedes albopictus*, and a few other *Aedes* species.
  - Some females not attracted to light traps are attracted to small dark containers.
  - Larvae and pupae collected from cans, bottles, tires, and other containers near human dwellings where eggs were laid.

Egg surveillance (cont)

- The ovitrap.
  - A black ~1-pint container with a “paddle,” filled 1-2/3 with water attractive to mosquitoes.
  - Place at ground level in sheltered, dark, but visible spots
  - Check weekly -- send positive paddles for identification.

Larvae Surveillance

- Found in water, so tools for surveillance are:
  - 1. White larvae dipper.
  - 2. White enamel pan.
  - 3. Aspirator -- turkey baster, eye dropper.
  - 4. Collection vials (with alcohol).

Collection techniques *Anopheles* species (anophelines)

- Method 1: Skim the surface of the water with one edge of the larval dipper and stop skimming before the dipper is full of water.

- Method 2: Depress lip of dipper below the surface of the water near plants or floating vegetation, allowing water to slowly flow into the dipper.

Culex and Aedes species (culicines)

- Larvae sink to the bottom rapidly when disturbed.
- A quick dip under the water is required, to collect larvae sinking to the bottom.

Mansonia species

- Get their oxygen by attaching to water plants below the water surface and taking air from the plant.
- Collect these by pulling up plants and vegetation from ponds and streams, then rinsing the material in a pan of clear water.

Advantages of larval surveillance

- Larval survey shows exact area where mosquitoes are breeding.
- Don’t have to wait for adult mosquitoes to come to light traps.
- Can monitor potential disease and pest outbreaks before mosquitoes reach the adult stage.

Adult Mosquito Surveillance

- Biting count -- collect mosquitoes that bite exposed skin.
- Landing count -- collect mosquitoes landing on skin or clothing before they bite.
- Tell exactly what species are biting people.
- Collect with an aspirator.

Warning: Do not use these methods if there is even a remote possibility that a vector-borne disease may be active in the area!

-- Volunteers must provide “informed consent.”

Adult Mosquito Surveillance

- Resting count -- mosquitoes seek shelter in cool, dark, undisturbed places.

- An artificial resting site -- the “red box.”
- 12”x12”x12” box painted red inside.
  - Place at ground to eye level near or in brush, forests, swamps, or similar sites.
  - Orient open end towards the west or the prevailing wind.

Light traps

- Attract adult mosquitoes to a trap.
- Proper placement is vital.
  - Bulb 5-6 feet off the ground.
  - Visible for up to 360º.
  - 50-100 feet from competing light.
  - Between breeding sites and populated area, in populated areas.
  - Close to mosquito fogging routes.

Types of light traps

- New Jersey light trap (NJLT)
  - Probably the most commonly used adult mosquito surveillance device in the Air Force.
  - Will trap the most species with the least amount of work.
  - Rugged and durable, but requires a 110 volt power source.

Types of light traps

- Solid State Army Miniature (SSAM) light trap
  - A miniature, portable battery-operated light trap
  - Used in situations where standard electrical power is not available.

Carbon dioxide (CO_2) baited traps

- Light traps baited with CO_2 (dry ice)
  - Attracts mosquitoes not attracted to light-baited traps.
  - Day- and night-flying species.
  - Used where competing light sources reduce effectiveness of light traps.
  - Does not attract “trash” insects or male mosquitoes.

Placement of Traps

- Placement of traps is extremely important -- place them correctly!
- Catches from all light traps should be collected early in the morning and packed for shipment as soon as possible.
  - Minimizes breakage of antennae, wings, legs, and other structures necessary for identification.

Black fly surveillance

- SSAM light traps baited with CO2 can be used to collect adult black flies.
- Operate during daylight and twilight hours.

Sand fly surveillance

- NJLT or SSAM traps baited with CO_2.
  - Hung 1-3 feet off the ground.
  - Screen funnel replaced with 40 mesh screen or nylon stocking material.
- Castor oil sticky traps using chemical lights as an attractant, and resting site collections are other surveillance methods for adult sand flies.

Biting midges

- The NJLT or SSAM light trap baited with CO2 can be used to collect adult biting midges.
  - Replace the screen funnel with 40 mesh screen or nylon stocking material.

Flea surveillance

- Adult fleas removed directly from live-trapped rodents and other animals.
- Collected from burrows by swabbing.
  - Flannel material wrapped around a pole, inserted into burrow and twisted.
  - Fleas trapped in the material are removed with forceps, placed in alcohol.

Tick surveillance

- Tick detection is fairly simple.
  - Tick drag -- in partially shaded areas with low vegetation, along the edge of thickets, or along animal trails.
  - 1-2 pound block of dry ice on a piece of light-colored cloth.
  - Base vet, local vets, and animal shelter workers.

Mite surveillance

- Normally no need to collect mites except in Asia where scrub typhus is endemic, but chigger surveys may be needed.
- Place black tile plates or construction paper on the ground along border of thickets or clumps of grass.
- Check in 1-2 hours for small yellowish-reddish colored objects crawling.

Lice surveillance

- Found in hairy parts of the body and on clothing where adults and eggs live.
  - Searching an individual's body would likely involve a clinical procedure or voluntary self-inspections.
- Inspect personal belongings -- clothing, headgear, and hair comb -- for lice and their nits.

Domestic and filth fly surveillance

- Adult survey methods are most practical.
  - Visual counting -- observation -- to determine if there are “too many.”
  - Dodge trap -- baited with “smelly” attractants, placed where flies congregate.
  - Fly tape -- inside buildings, also serves as a means of control.

Cockroach surveillance

- The purpose of cockroach surveillance is to determine:
  - If a cockroach problem exists.
  - What species are present.
  - If the problem is severe enough that control is necessary.
  - If pesticidal control was effective.

Cockroach surveillance

- Survey methods:
  - Visual observations:
    - Call-in complaints.
    - Routine sanitary inspections.
  - Night survey.
  - Sticky trap -- limited control.
  - Aerosol “flush”.

Communication

- Civil Engineering pest management needs to know surveillance results.
- MTF/CC -- keep him/her informed.

Communication

- Flight Medicine -- inform as necessary, seek information on bites, vector-borne diseases, etc.
- Local population -- know what is going on, keep local authorities informed.

Questions?